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(54) Umbrella.

(57) The umbrella mechanism (10) of the invention comprises a central hub (12) and a plurality of elongate spokes (16), each comprising a pair of flat resilient strips (16.1 and 16.2) which may be of metal or a plastics material. One of the ends of each of the resilient strips (16.1 and 16.2) are connected to the hub (12) and the other end is connected to a canopy (66). The resilient strips (16.1 and 16.2) are movable between an extended configuration in which they extend outwardly from the hub (12) and a storage configuration in which they are wound around the hub (12) in an overlapping relationship with the other spokes (16). Guide formations (20), radially arranged around the hub (12), facilitate movement of the spokes (16) between their extended and storage configurations. The umbrella mechanism preferably also includes a handle (14) which comprises a piece of strip material which is coiled within the hub (12) in its inoperative configuration and which is uncoiled into an extended volute spring shape in its operative position.

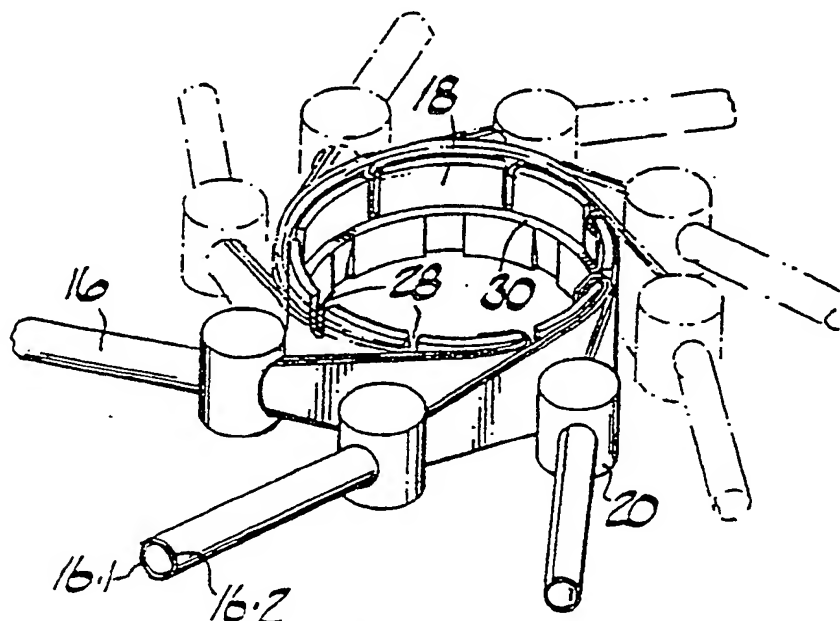


FIG 6

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## UMBRELLA

This invention relates to an umbrella mechanism.

The frames of most umbrellas are collapsible in some way. The spokes of the frame are usually pivotable relative to a handle between an open and a closed position and often the handle telescopes into a shortened form. Notwithstanding the collapsibility of existing umbrellas, they are still bulky items which are cumbersome and difficult to transport.

Russian Patent No. SU 479 468 discloses an umbrella mechanism with a central hub, from which metal guide means extend to guide spokes between an inoperative position in which they are wound around the hub and an operative position in which they extend from the hub. A disadvantage of this umbrella mechanism is that the spokes are single strips which, in their operative position, are not strong enough to support a tautly pulled canopy. A further disadvantage of this umbrella mechanism is that the bulky guide means and handle detract from any compactness the coiled spokes may provide and that when the umbrella is in its collapsed form, the bulky guide means, which must be turned downwardly, tend to stress the spokes and could cause them to snap and break.

According to the invention an umbrella mechanism comprises:

a hub; and

a plurality of elongate spokes, each spoke comprising at least two flat, resilient strips and being connected at one end to the hub, and being movable between an extended configuration in which it extends outwardly from the hub and a storage configuration in which it is wound around the hub in an overlapping relationship with the other spokes.

The umbrella mechanism preferably also includes guide means for guiding the spokes between their storage and extended configurations.

The guide means may include a plurality of guide formations which are arranged around the hub.

Each guide formation preferably has a transverse guide aperture or slot defined therein which extends substantially tangentially relative to the outer periphery of the hub.

The guide apertures or slots are preferably frustoconical with their wider ends closer to the hub than their narrower ends, to facilitate the formation of cylindrical tubes by the strips as they are unwound from the hub and to facilitate their flattening as they are wound onto the hub.

The guide means may also include an upper and a lower circular disc, which are arranged axially from one another, at either end of the guide means to provide lateral support for the strips.

Each spoke, in its extended configuration, preferably extends substantially tangentially from the hub.

The pair of flat strips comprising each spoke are preferably flat steel or plastics strips arranged in adjacent parallel face to face relationship with one another, when wound around the hub.

The flat, resilient, steel or plastics strips are preferably treated to adopt a memory position in which they are C-shaped in section.

In their extended configuration, the strips of each spoke overlap to define a cylindrical tube.

When unwound from the hub, each strip preferably defines an arc of about 275°, in section.

The umbrella preferably also includes a handle attached to the hub.

The handle is preferably a single length of strip material with one of its ends attached to a bush mounted coaxially in the hub, the length of strip material being wound onto the bush in its inoperative configuration.

The other end of the strip material is preferably attached to a first collar spaced radially from and mounted coaxially with the bush.

The single length of strip material of the handle may be moved to its extended configuration by moving the first collar axially away from the hub so that the strip forms a helix, and it may be locked in the extended configuration by rotating the collar relative to the bush to cause the overlapping portions of the helix to frictionally engage one another.

The handle may have stop means to limit the extension of the handle.

The handle may also have locking means for locking the handle in its extended configuration.

The locking means may be a pair of opposed catches disposed on the collar and biased to engagement with the hub.

According to another aspect of the invention an umbrella mechanism comprises:

a hub; and

a plurality of elongate spokes, each spoke comprising an elongate, resilient cylindrical member, and being connected at one end to the hub, and being movable between an extended configuration in which it extends outwardly from the hub and a storage configuration in which it is wound around the hub in an overlapping relationship with the other spokes.

The resilient material is preferably a plastics material, for example glass-reinforced plastic, Kevlar®, carbon fibre or nylon.

An embodiment of the invention will now be described in greater detail, with reference to the accompanying drawings, in which:-

Figure 1 is a schematic side view of an umbrella of the invention;

Figure 2 is a schematic plan view of the umbrella of Figure 1;

Figure 3 is a schematic plan view of portion of the hub of the umbrella;

Figure 4 is a sectional side view of guide means used in the hub of Figure 3;

Figure 5 is a exploded pictorial view of portion of a spoke used in the umbrella;

Figure 6 is a pictorial view of the hub of Figure 3;

Figure 7 is a sectional end view of the spoke in exploded form, in its memory position;

Figure 8 is a sectional end view of the spoke in its operative configuration, in its memory position;

Figure 9 is an exploded sectional view of a portion of the hub and handle mechanism of the umbrella, with the spokes omitted for the sake of clarity;

Figure 10 is a sectional assembled view of the hub and handle;

Figure 11 is a partly sectioned underneath plan view of a collar used in the handle; and

Figure 12 is a schematic pictorial view of portion of the handle.

Referring to Figures 1 and 2, reference numeral 10 generally indicates an umbrella mechanism in accordance with the invention. The umbrella includes a central hub 12 and a handle 14. The hub 12 has a plurality of spokes 16 which extend radially outwardly from it when the umbrella is opened.

Referring now to Figure 3, each spoke 16 comprises a pair of cold rolled steel strips 16.1 and 16.2 which, when the umbrella is in its folded state, lie in parallel face to face relationship around a core 18. As shown in Figure 6, the inner ends of the strips 16.1 and 16.2 are bent over and anchored in a plurality of circumferentially spaced slots 28 defined in the core 18. A collar 32 which is not shown in Figure 6 but is shown in Figure 9, fits snugly within the core 18 against a shoulder 30 to retain the inner ends of the strips in position.

By manually pulling on any one of the spokes 16, in a direction tangential to the core 18, all the spokes 16 are simultaneously extended. The spokes 16 bow slightly, as shown in Figure 1, to form an umbrella of conventional shape.

The strips 16.1 and 16.2 are formed either by extrusion through a die or by rolling them. They are then subjected to an annealing process and hardened and tempered, preferably by austempering, after being formed so that when they are drawn off the core 18, as the umbrella is opened, they adopt a C-shaped memory configuration as shown in Figures 5, 7 and 8. In their extended configuration, each strip of the pair is arranged in opposed, part circular, part overlapping relationship with the other strip of the pair thereby to form a round cylindrical tube. In section, each strip defines an arc of about 275°.

The annealing process is an atmospheric one, to prevent oxidation of the steel. After the annealing or heat-treatment process, the strips are then shaped by quenching. The specific time at which this is done

varies the degree of memory retention by the strips. The strips may also be treated to limit their corrosion, by electro-galvanisation or by cadmium plating.

It will be appreciated that as the memory position of the spokes 16 is their extended configuration, energy is required to return the spokes 16 to their flat, folded, storage configuration, coiled around the core 18. This stored energy is then available to assist the outward movement of the spokes 16 while they are being advanced to their extended configuration.

The strips are about 0.05 mm thick and about 12 mm wide. They comprise sufficient carbon to render them rigid, about 0.7% to 0.8%. They also comprise about 0.5% to 0.8% of manganese, about 0.15% to 0.3% silicon, a maximum of 0.04% of phosphorous, and a maximum of about 0.05% sulphur, the percentages being by weight. The strips also comply with American Standard SA 1074, AITS C 1074.

When in their operative configuration, the strips 16.1 and 16.2 reinforce one another so that they provide a rigid frame which will withstand the force exerted by a canopy 66 when the umbrella is opened and it is pulled taut. Prior art spokes, comprising only a single strip of material, are too weak to support a canopy and tend to collapse when it is pulled taut.

In order to assist and guide the spokes 16 in the transformation from their flat, folded state to their tubular, unfolded state as they move from their inoperative to operative configurations, the hub 12 has a plurality of guide formations 20 radially arranged on it, relative to the core 18 and circumferentially relative to each other.

A cross sectional view of the guide formations 20 is shown in Figure 4. Each guide formation 20 has a transverse guide aperture 22 defined therein which is frusto-conical. The wider end of the guide aperture 22 faces towards the core 18 and its narrower end faces outwardly in a tangential direction relative to the periphery of the core 18. When the spokes are in their storage configuration, there is sufficient frictional engagement between the spokes 16 and the guide apertures 22 to retain the spokes 16 in their folded position. The guide formations 20 are sandwiched between and supported by a lower circular disc 24 and an upper circular disc 26, as shown in Figures 9 and 10. They are screwed to the discs 24 and 26 which, in turn, complementally engage the core 18.

The handle 14, illustrated in Figures 9 and 10, is formed from a single length of spring steel strip 34 similar to the spring steel strips 16.1 and 16.2 but which is treated to have a memory position in an extended volute spring shape. The inner end of the spring steel strip 34 is anchored in a slot 38 defined in a bush 36 and its outer end is fixed to a collar 40. The collar 40 has, near its base, a groove 42 formed therein to make its side walls 44 flexible. The flexibility of the collar 40 is also enhanced by longitudinal slits 46 defined in the side walls 44. A peripheral lip 51 is

defined at its top end.

The collar 40 is in turn located within a holder 48 which has a frusto-conical recess 50 at its upper end to accommodate the lip 51. The holder 48, as shown more clearly in Figure 11, has opposed longitudinally extending slots 52 formed in its outer wall. The slots 52 accommodate pivotally mounted catches 54 which are biased by springs (not shown) to engage an inner periphery 56 of the lower circular disc 24, as shown in Figure 10, to retain the handle 14 in its inoperative, collapsed state.

In order to extend the handle, the catches 54 are depressed inwardly to clear the inner periphery 56 of the lower disc 24. The holder 48 is then moved in an axial direction downwardly away from the hub 12 thereby causing the spring steel strip 34 to unwind into a volute form, as schematically illustrated in Figure 12. As the strip 34 uncoils into its volute form, there is increased space between the inner surface of the holder 48 and the outer periphery of the collar 40. In order to reduce this space, as the handle is extended, the frusto-conical recess 50 on the holder 48 cams against the lip 51 thereby urging the upper end of the collar 40 radially inwardly to keep the upper inner face of the collar 40 in contact with the outer periphery of the strip 34.

Once the strip 34 is extended, the holder 48 is rotated relative to the bush 36 to tighten the coils of the spring steel strip 34 so that the overlapping portions are brought into frictional engagement to retain the handle in its extended form. The degree of extension of the handle is limited by a tie member 58 which is in the form of a length of string, wire, or the like, and which is connected at one end to an aperture 60 provided at the end of a screw 62 and at its other end to an aperture 64 defined in a lug provided in the collar 40.

The screw 62, which engages a complementary threaded formation 68 defined in the bush 36, also serves to locate a canopy 66 (only shown in Figures 1 and 2) centrally on the hub 12. The outer ends of the canopy 66 are attached to the outer ends of the spokes 16 in a conventional fashion.

In a further embodiment of the invention, which is not illustrated, solid cylindrical plastics spokes can be wound onto a central hub. Such spokes have a diameter of 2 mm and would not flatten as they were wound around the hub. Nevertheless, the small diameter of the spokes still renders the umbrella, in its folded state, a compact one. The solid spokes, while being flexible, are still rigid enough to support a canopy. The spokes can be made of glass-reinforced plastics material, Kevlar®, carbon fibre or nylon. A handle arrangement, similar to that illustrated above, could optionally also be used in this type of umbrella. This embodiment is particularly suitable for large umbrellas, for example beach and golf umbrellas.

The combination of spokes which can be wound

around a central hub and an optional handle which can be wound around a bush which fits co-axially into the hub provides an umbrella which is extremely compact when in its folded state. It can thus easily be carried in a person's pocket or handbag. When unfolded, the umbrella may have a transverse width of about 850 mm and height of about 400 mm, while, when folded, it may have a width of about 80 mm and a height of about 26 mm. Despite the compactness of the umbrella, the double strip or solid cylindrical spokes also provide a rigid frame which can easily support a canopy stretched tautly across it. The umbrella need not have a collapsible handle, or a handle at all, as the hub could be mounted for example on a pole or the like for use outdoors.

## Claims

1. An umbrella mechanism (10) characterised in that it comprises:
  - a hub (12) ; and
  - a plurality of elongate spokes (16), each spoke (16) comprising at least two flat, resilient strips (16.1 and 16.2) and being connected at one end to the hub (12) and being movable between an extended configuration in which it extends outwardly from the hub (12) and a storage configuration in which it is wound around the hub (12) in an overlapping relationship with the other spokes (16).
2. An umbrella mechanism (10) according to claim 1 characterised in that it includes guide means for guiding the spokes (16) between their storage and extended configurations.
3. An umbrella mechanism (10) according to claim 1 or claim 2 characterised in that the spokes (16) extend substantially tangentially from the hub (12) in their extended configurations.
4. An umbrella mechanism (10) according to any one of claims 1 to 3 characterised in that the flat resilient strips (16.1 and 16.2) of each spoke (16) are treated to adopt a memory position in which they are C-shaped in section.
5. An umbrella mechanism (10) according to claim 4 characterised in that the flat resilient strips (16.1 and 16.2) of each spoke (16) overlap to define a cylindrical tube, in the extended configuration of the spoke (16).
6. An umbrella mechanism (10) according to claim 4 or claim 5 characterised in that the flat, resilient strips (16.1 and 16.2) of each spoke (16) are arranged in adjacent parallel face to face relation-

- ship with one another in the storage configuration of the spoke (16).
7. An umbrella mechanism (10) according to any one of claims 4 to 6 characterised in that, in section, each strip (16.1 and 16.2) defines an arc of about 275°, in the extended configuration of the spoke (16).
  8. An umbrella mechanism (10) according to any one of claims 2 to 7 characterised in that the guide means includes a plurality of guide formations (20) which are arranged radially around the hub (12).
  9. An umbrella mechanism (10) according to claim 8 characterised in that each guide formation (20) has a transverse guide aperture or slot (22) defined therein which extends substantially tangentially relative to the outer periphery of the hub (12).
  10. An umbrella mechanism (10) according to claim 9 characterised in that the guide slots or apertures (22) are frusto-conical in shape with their wider ends closer to the hub (12) than their narrower ends, to facilitate movement of the spokes (16) between their extended and storage configurations.
  11. An umbrella mechanism (10) according to any one of claims 2 to 10 characterised in that an upper and a lower circular disc (26 and 24), which are spaced axially from one another, are disposed at opposite ends of the guide means to provide lateral support for the strips (16.1 and 16.2).
  12. An umbrella mechanism (10) according to any one of the preceding claims characterised in that includes a handle (14) attached to the hub (12).
  13. An umbrella mechanism (10) according to claim 12 characterised in that the handle (14) comprises a single length of strip material (34) with one of its ends attached to a bush (36) mounted co-axially in the hub (12), the handle (14) being movable between an extended configuration in which it depends from the hub (12) and a storage configuration in which it is wound around the bush (36).
  14. An umbrella mechanism (10) according to claim 13 characterised in that the other end of the strip material (34) is attached to a first collar (40), spaced radially from and mounted co-axially with the bush (36), the first collar (40) defining a peripheral lip (51) at its upper end.
  15. An umbrella mechanism (10) according to claim 14 characterised in that further comprises a holder (48) within which the first collar (40) can be accommodated, the holder (48) defining a recess (50) to accommodate the peripheral lip (51).
  16. An umbrella mechanism (10) according to claim 15 characterised in that the handle (14) is moved to its extended configuration by moving the holder (48) and the first collar (40) axially away from the hub (12) so that the strip (34) forms a helix.
  17. An umbrella mechanism (10) according to any one of claims 14 to 16 characterised in that the handle (14) is locked in its extended configuration by rotating the first collar (40) relative to the bush (36) to cause the overlapping portions of the helix to engage one another frictionally.
  18. An umbrella mechanism (10) according to any one of claims 12 to 17 characterised in that the handle (14) has stop means (58) to limit its extension.
  19. An umbrella mechanism (10) according to any one of claims 12 to 18 characterised in that the handle (14) has locking means for locking the handle (14) in its stored configuration.
  20. An umbrella mechanism (10) according to claim 19 characterised in that the locking means are a pair of opposed catches (54), disposed on the holder (48), and biased to engagement with the hub (12).
  21. An umbrella mechanism (10) according to any one of claims 1 to 20 characterised in that the hub (12) includes a core (18) which has a plurality of circumferentially spaced slots (28) defined therein within which one end of the spokes (16) is received.
  22. An umbrella mechanism (10) according to claim 21 characterised in that it also includes a second collar (32) which fits snugly within the core (18) to retain the ends of the spokes (16) within the slots (28).
  23. An umbrella mechanism (10) characterised in that it comprises comprising a hub (12) and a plurality of elongate spokes (16), each spoke (16) comprising an elongate, resilient, cylindrical member and being connected at one end to the hub (12), and being movable between an extended configuration in which it extends outwardly from the hub (12) and a storage configuration in which it is wound around the hub (12) in overlapping relationship with the other spokes (16).

**24.** An umbrella mechanism (10) according to claim 23 characterised in that the resilient material is a plastics material.

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**25.** An umbrella (10) characterised in that it comprises an umbrella mechanism (10) according to any one of claims 1 to 24 and a flexible canopy (66) extending between the spokes (16) and attached to their ends remote from the hub (12).

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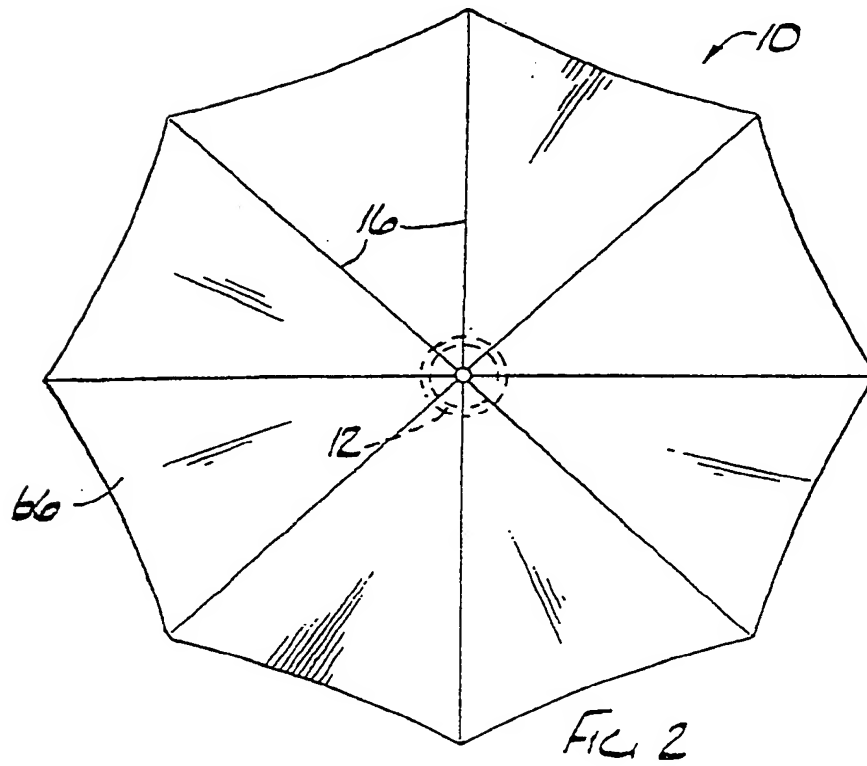
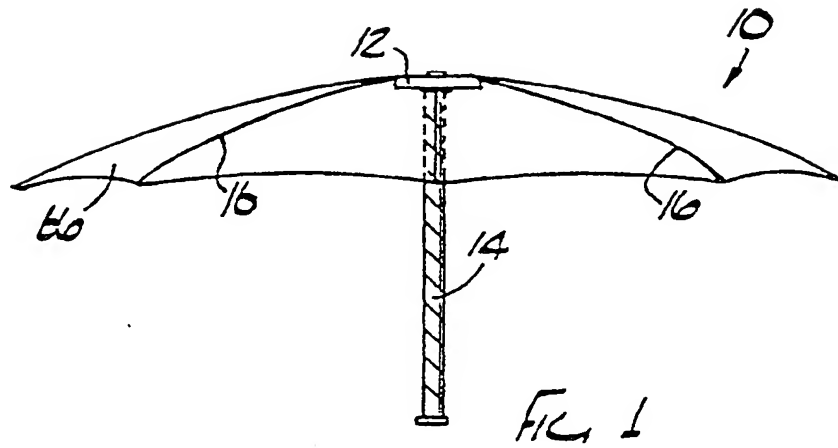
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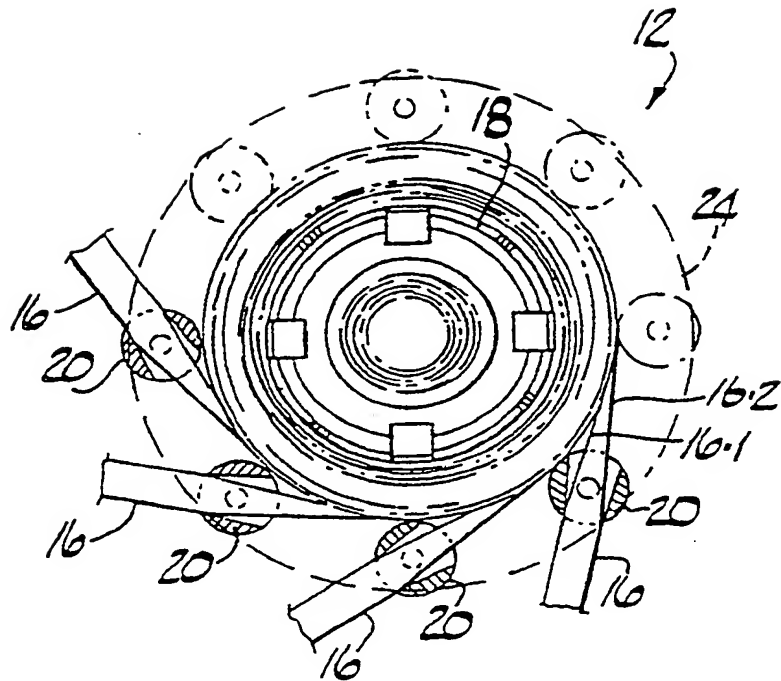


FIG 3

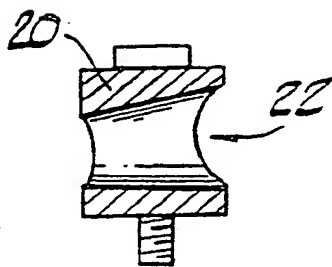


FIG 4

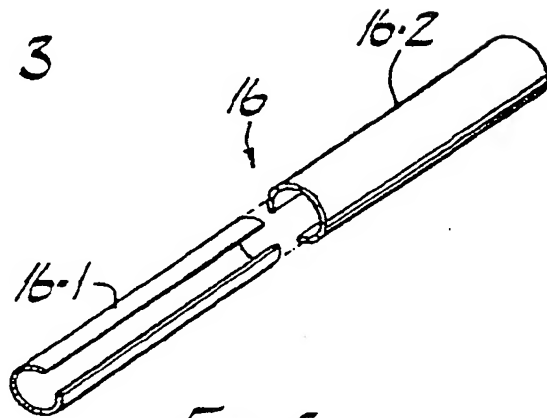


FIG 5



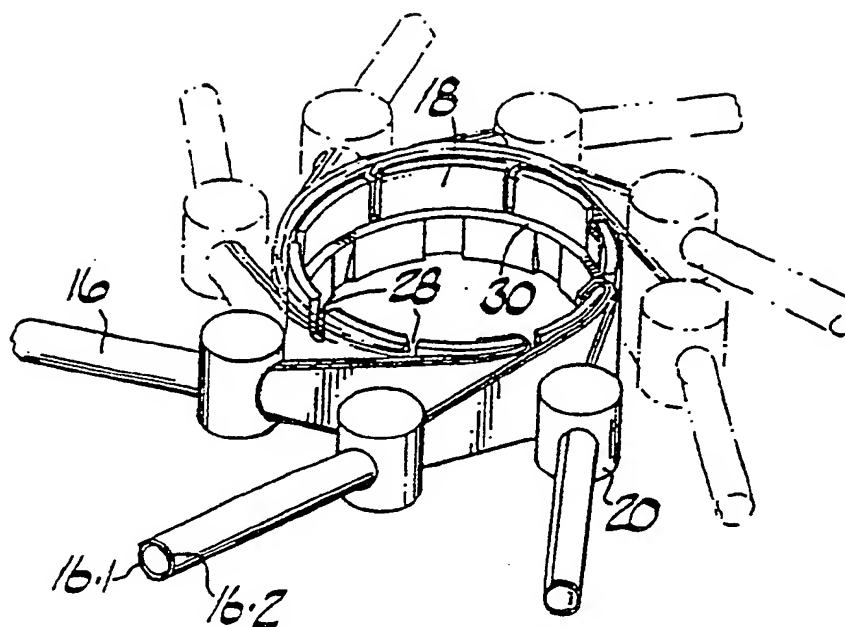


FIG. 6

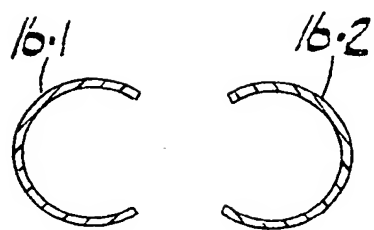


FIG. 7

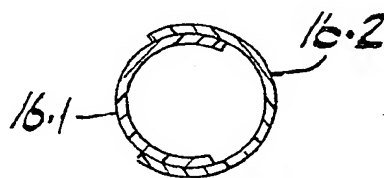
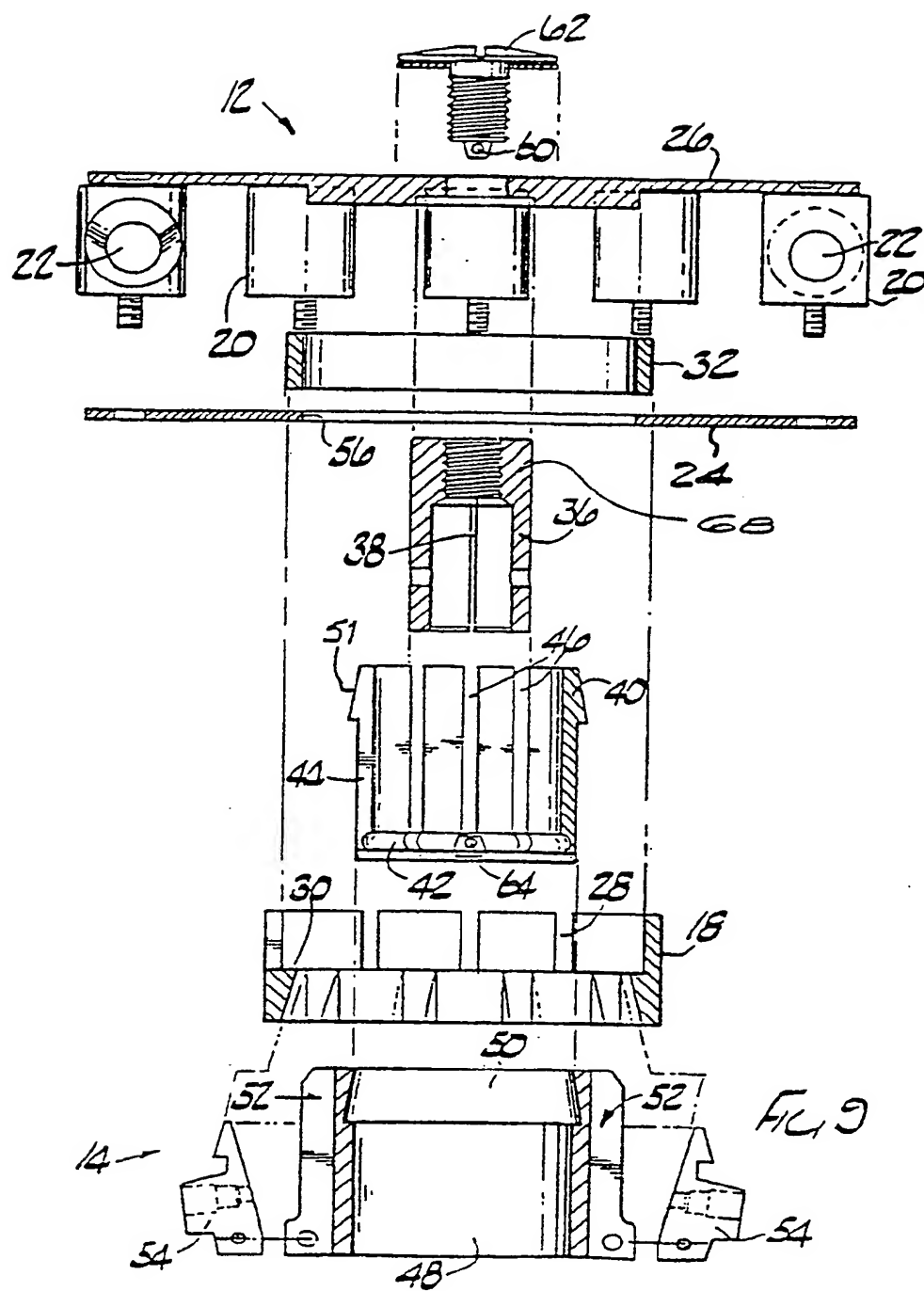


FIG. 8



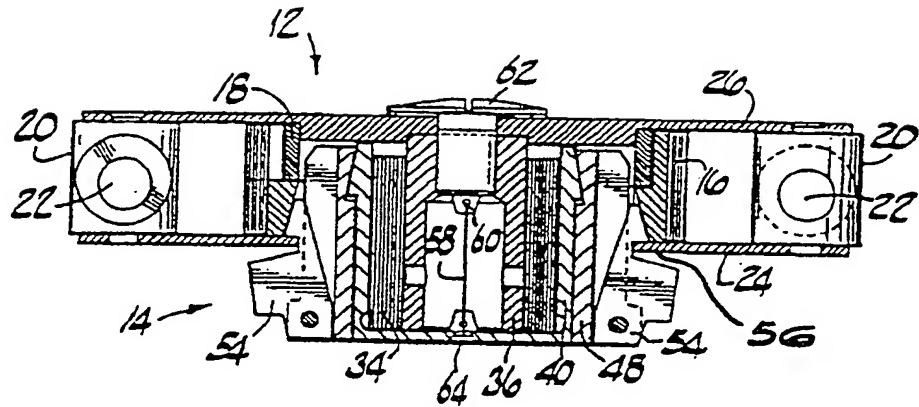


FIG 10

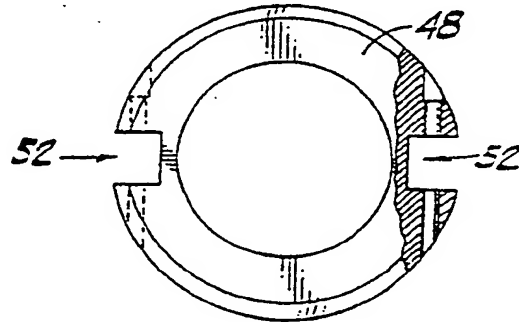


FIG 11

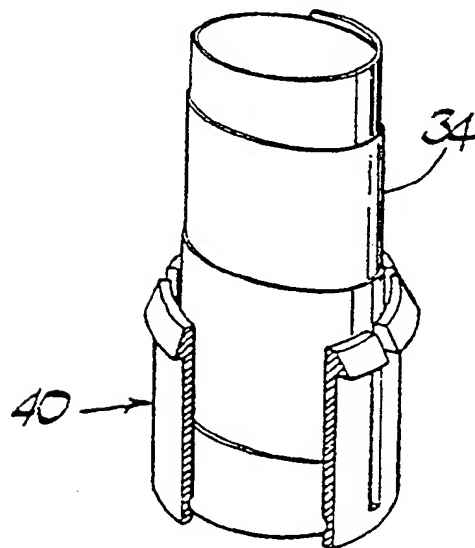


FIG 12



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# EUROPEAN SEARCH REPORT

Application Number

EP 91 30 1750

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. CL <sup>5</sup> )
X	WORLD PATENT INDEX week 7623 Derwent Publications Ltd, London, GB Accession number 76-F2520X [23] "abstract"	23, 25	A45B19/00
A		1-3, 8-9, 12, 21	
D	& SU-A-479 468 (DMITRIEVSKII) December 18, 1975 * figures 1, 5 *		
A	US-A-1 998 291 (SHERMAN)  * page 1, right column, line 22 - page 2, left column, line 67; figures 4, 5, 11-13 *	1-4, 12, 18, 21, 25	
			TECHNICAL FIELDS SEARCHED (Int. CL <sup>5</sup> )
			A45B
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 04 JUNE 1991	Examiner BRIDAULT A. A. Y.
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